Controlling Linearity in N-Polar GaN MISHEMTs
Tech ID: 31968 / UC Case 2020-708-0

BACKGROUND

Current derivative cancellation techniques use multiple discrete devices to linearize transistors. These techniques are unable scale up to mm-wave frequencies due to the parasitics associated with combining multiple devices. This causes third-order non-linearities which lead to undesirable effects such as in-band signal distortion and unnecessary system-level complexities. Thus, the linearization of transistors in communication systems has a significant impact on overall device performance.

DESCRIPTION

Researchers at the University of California, Santa Barbara have enhanced the linearity of N-polar GaN MISHEMTs at mm-wave frequencies (30 GHz and beyond) for low-power receiver applications within a single device. Applying the derivative cancellation technique in a single device removes the need for digital pre-distortion, directly simplifies system-level complexities, and increases overall transistor linearity. Furthermore, N-polar GaN MISHEMTs with improved RF transistor linearities have demonstrated improved power performance and power-added efficiency at 94 GHz.

ADVANTAGES

▶ Improved device performance
▶ Simplified production
▶ No need for digital pre-distortion

APPLICATIONS

▶ Transistors
▶ GaN Devices
▶ Radio Communication

PATENT STATUS

Patent Pending

INVENTORS

▶ Buckwalter, James F.
▶ Guidry, Matthew
▶ Karnaty, Rohit R
▶ Keller, Stacia
▶ Mishra, Umesh K.
▶ Romanczyk, Brian
▶ Shrestha, Pawana

OTHER INFORMATION

KEYWORDS

linearity, MISHEMT, derivative cancellation, transistor, N-polar, GaN

CATEGORIZED AS

▶ Semiconductors
▶ Assembly and Packaging
▶ Design and Fabrication
▶ Materials

RELATED CASES

2020-708-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

▶ Achieving “Active P-Type Layer/Layers” In III-Nitride Epitaxial Or Device Structures Having Buried P-Type Layers
▶ High-Quality N-Face GaN, InN, AlN by MOCVD
▶ Improved Dynamic Range in RF Communication Over Optical Fiber
▶ Defect Reduction in GaN films using in-situ SiNx Nanomask
▶ Device Structures Utilizing Barrier Enhancement Conductive Materials on N-polar III-N
▶ Laser Diode With Tunnel Junction Contact Surface Grating
▶ High Mobility Group-III Nitride Transistors with Strained Channels
▶ A Structure For Increasing Mobility In A High-Electron-Mobility Transistor
▶ Fabrication of Relaxed Semiconductor Films without Crystal Defects
▶ Improved Fabrication of Nonpolar InGaN Thin Films, Heterostructures, and Devices
▶ Methods for Locally Changing the Electric Field Distribution in Electron Devices
▶ Universal Two-Tap Feed-Forward Equalization Using a Differential Element
▶ Incorporating Temperature-Sensitive Layers in III-N Devices
▶ Technique for the Nitride Growth of Semipolar Thin Films, Heterostructures, and Semiconductor Devices
▶ (In,Ga,Al)N Optoelectronic Devices with Thicker Active Layers for Improved Performance
- N-polar III-N Semiconductor Device Structures Enabled by Wet Chemistry
- GaN-based Vertical Metal Oxide Semiconductor and Junction Field Effect Transistors
- Novel Current-Blocking Layer in High-Power Current Aperture Vertical Electron Transistors (CAVETs)
- III-N Transistor With Stepped Cap Layers
- Polarization-Doped Field Effect Transistors with Increased Performance
- Wafer Bonding for Embedding Active Regions with Relaxed Nanofeatures
- III-N Based Material Structures and Circuit Modules Based on Strain Management